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(54) **LOCKING DEVICE WITH MECHANICAL DETECTION OF CLOSURE AND OPENING**

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(Continued)

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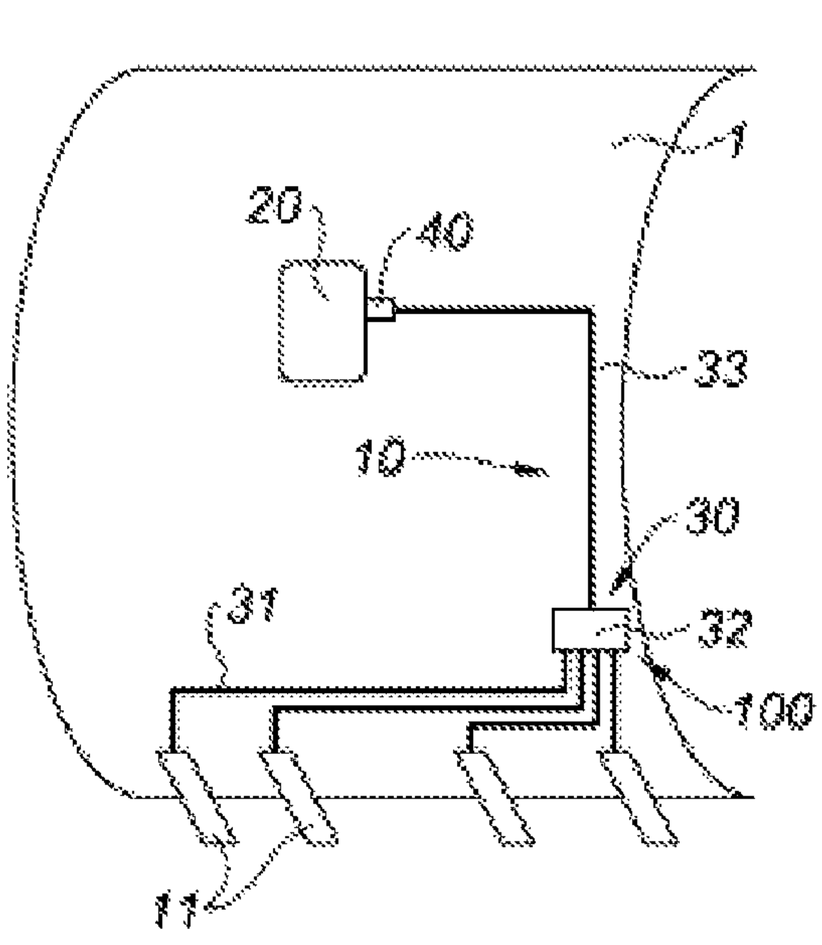
(57) **ABSTRACT**

A locking device between a first structure and a second structure includes a bolt to lock the first and second structures, an indicator as to whether the bolt has locked/unlocked the structures, and a connecting system. The bolt includes a lock bolt attached to the first structure and able to engage a hook which is attached to the second structure. In particular, the connecting system connects the bolt with the lock bolt to the indicator, and the hook is mounted such that it can move between a first position in which it is engaged with the lock bolt and allows the indicator to be locked, and a second position in which the hook is free of the lock bolt and allows the indicator to be unlocked.

19 Claims, 2 Drawing Sheets



(51) **Int. Cl.**

E05B 41/00	(2006.01)
E05B 63/14	(2006.01)
E05C 1/08	(2006.01)
E05B 53/00	(2006.01)

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(58) **Field of Classification Search**
USPC 292/150, 163, 129
See application file for complete search history.

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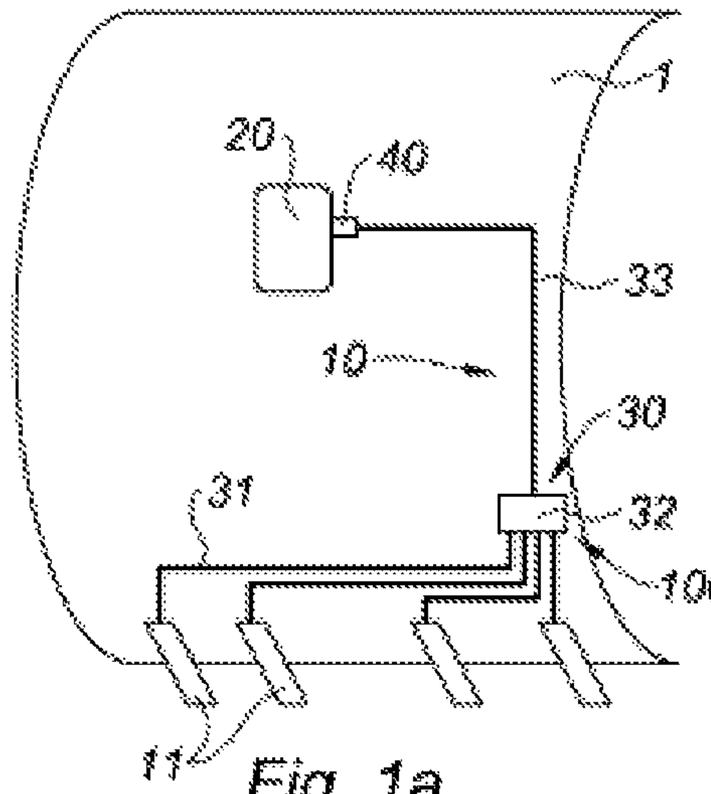

Fig. 1a

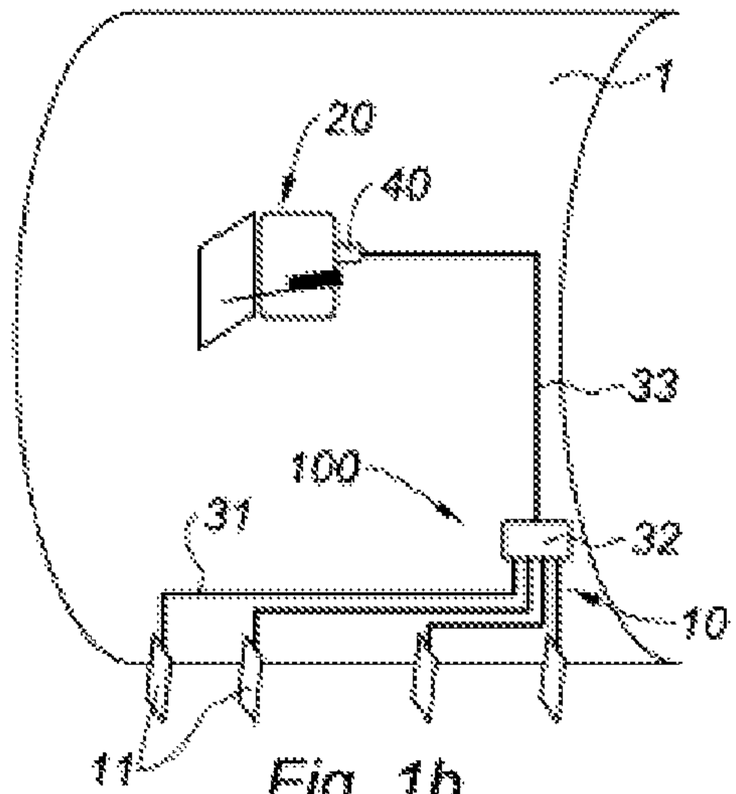

Fig. 1b

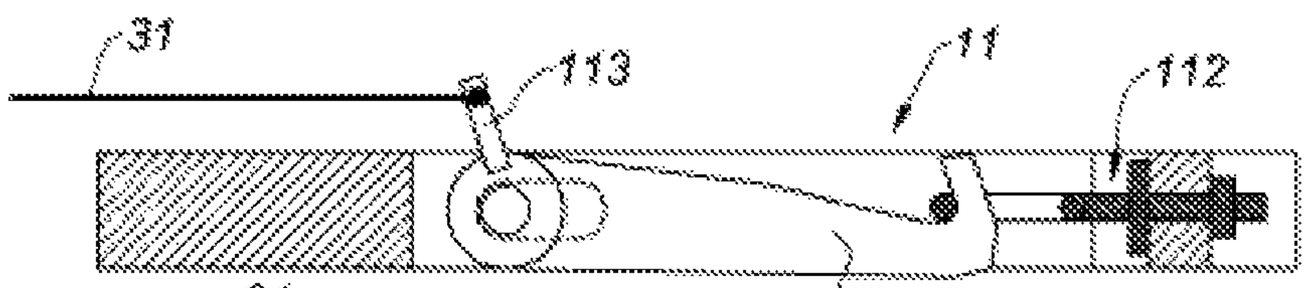

Fig. 2a

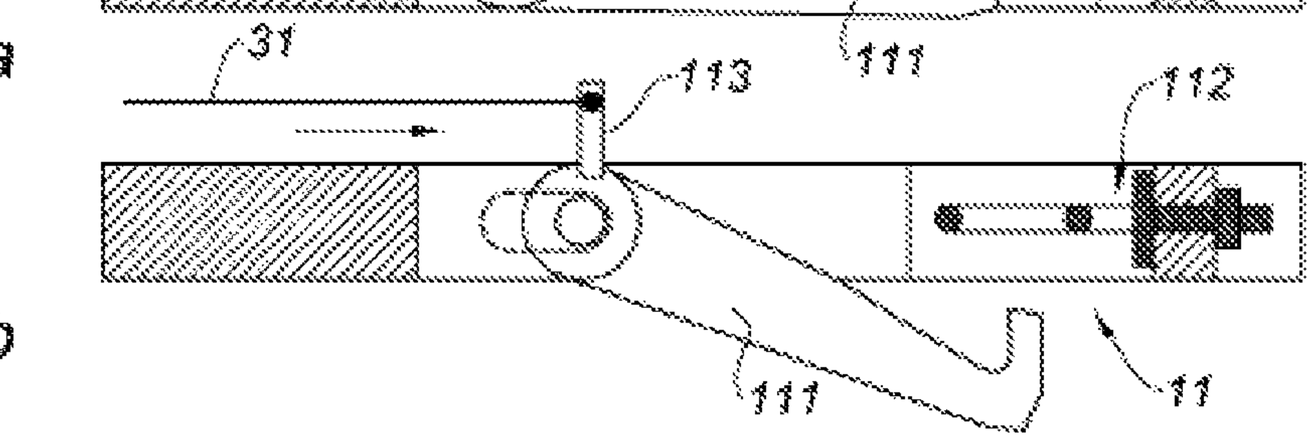

Fig. 2b

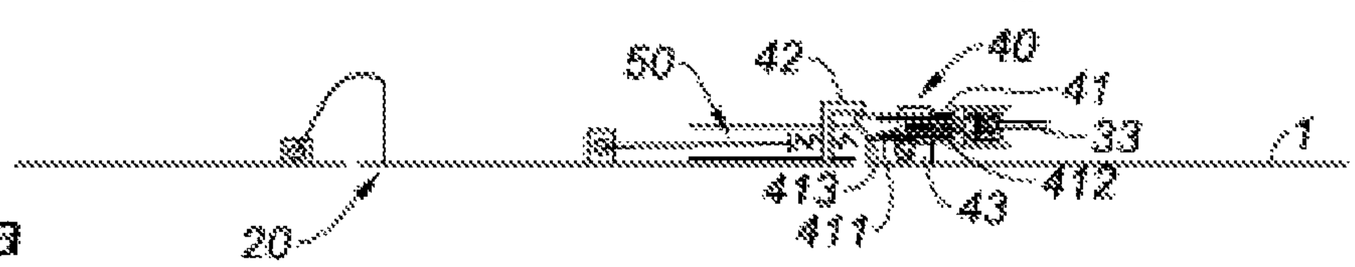

Fig. 3a

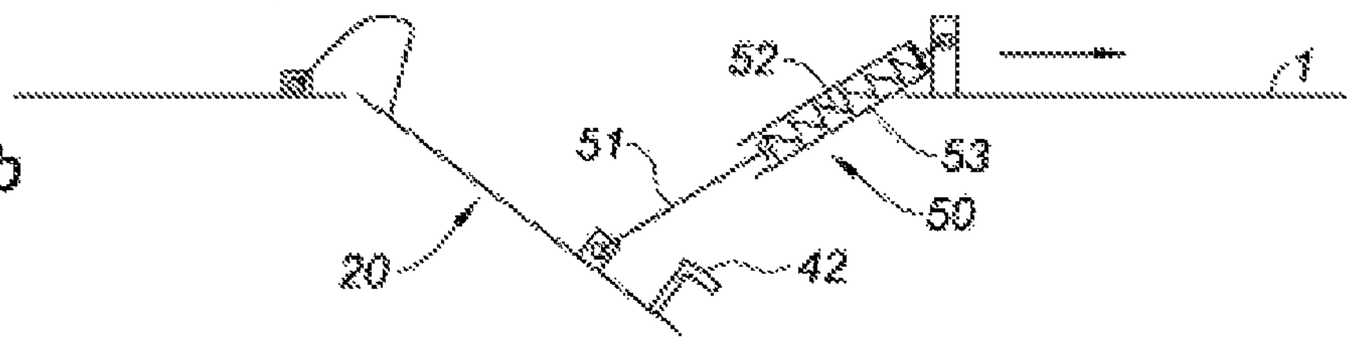

Fig. 3b

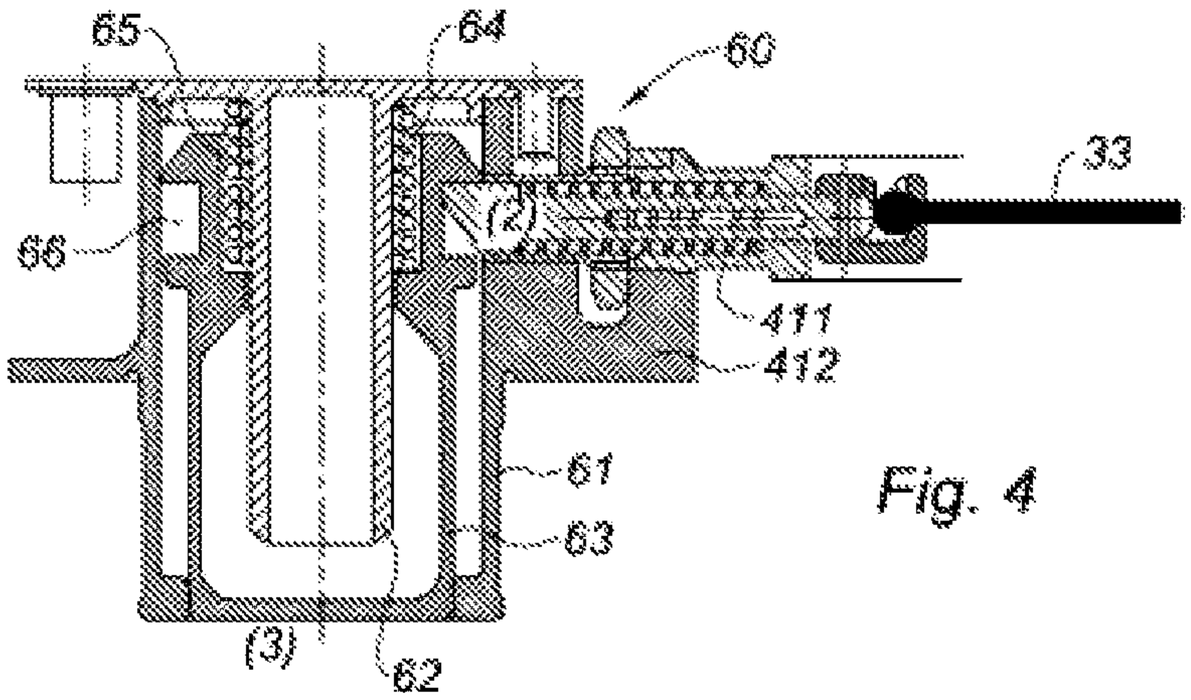

Fig. 4

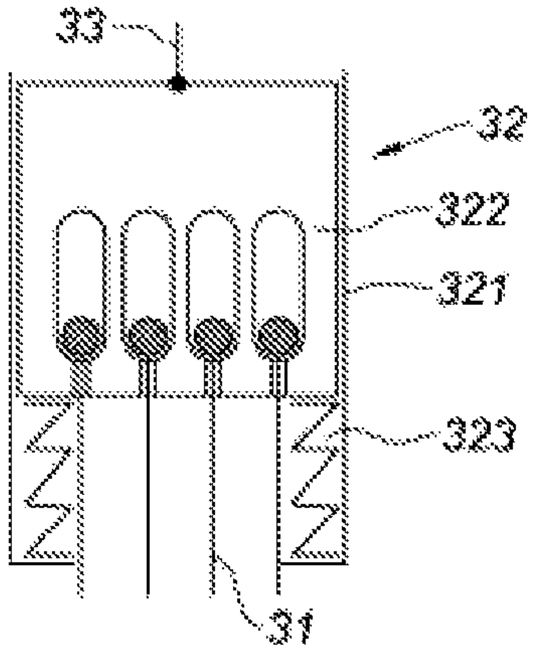

Fig. 5a

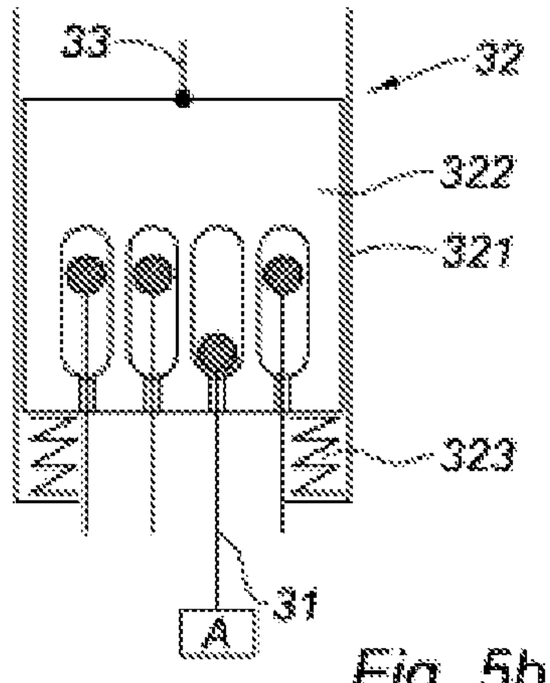

Fig. 5b

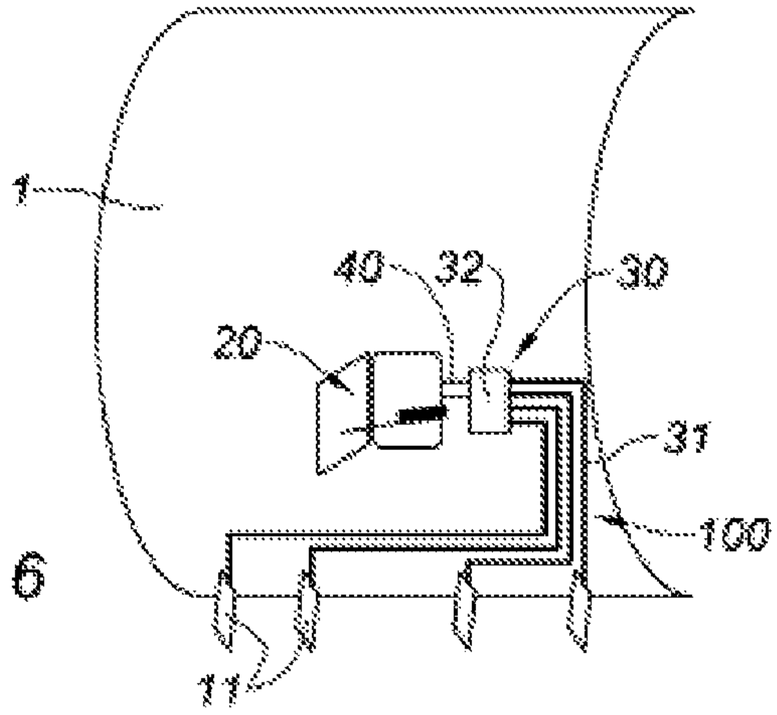

Fig. 6

LOCKING DEVICE WITH MECHANICAL DETECTION OF CLOSURE AND OPENING

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation of International Application No. PCT/FR2012/050586, filed on Mar. 21, 2012, which claims the benefit of FR 11/52562, filed on Mar. 29, 2011. The disclosures of the above applications are incorporated herein by reference.

FIELD

The present disclosure relates to a system for locking a turbojet engine nacelle cowl.

BACKGROUND

The statements in this section merely provide background information related to the present disclosure and may not constitute prior art.

An airplane nacelle is designed to surround a turbojet engine and produce the thrust for the turbojet engine by channeling the flows created by the engine. It must also be able to be opened in order to access the engine and its equipment.

Most turbojet engine nacelles comprise a fan cowl surrounding the fan case of the engine and a rear body (often the thrust reverser) surrounding the central part of the engine.

To provide access to the engine and its equipment, these two nacelle components generally open in two half-parts.

The opening of these cowls is made possible owing to the presence of hinges, generally mounted in the upper part of the nacelle, in the so-called twelve o'clock position, along a mast line, and are kept closed owing to a plurality of bolts generally mounted along a locking line in the lower portion, called the six o'clock portion.

It is of course important that after a maintenance operation, all of the bolts be closed.

To that end, it is important to be able to provide, effectively, safely and quickly, that all of the opening cowls of a nacelle are properly locked before starting up the nacelle.

Today, in most cases, this verification is based almost entirely on the vigilance of the operator performing the locking operation.

As a result, certain maintenance errors have caused a significant number of poor fan cowl closures, sometimes causing major in-flight events (opening and/or loss of a fan cowl).

One of the most frequent causes of in-flight opening is the partial closure or opening of the cowl bolts.

In that scenario, it is often difficult during a routine verification to see that one or more bolts are closed incorrectly, since locking a single bolt "positions" the cowl, which then appears correctly closed from a distance.

A clear indicator of the locking state of the nacelle cowls improves flight safety.

This indicator is crucial to alert maintenance operators or any other personnel to the fact that the locking of the cowls has not been done correctly.

One thereby avoids complete or partial destruction of the cowls during flight.

Furthermore, to provide an effective system for detecting the locking of the nacelle cowls, it must be impossible to initiate unlocking or to be able to partially unlock the cowl without the corresponding locking state indicator displaying an unlocked state.

There is also a need for a system for detecting the locking of the nacelle cowls meeting the aforementioned requirements.

In particular, electric locking detection systems for nacelle cowls are known making it possible to perform a visual check of the situation.

Such an electrical system nevertheless requires an electrical power source and is subject to any electrical failures.

Where mechanical detection systems are concerned, one of the difficulties is then making sure that the state indicator for the locking of the nacelle cowls displays an unlocked state once the first bolt is open, and vice versa, that that indicator cannot transition to the locked state unless absolutely all of the bolts are locked.

Furthermore, the existing mechanical detection systems are limited to checking the position of the handle of the bolt, whereas the desired mechanical function is the stressing of the bolts.

Thus, a mechanical detection system is known that provides for painting a bright color on a bolt handle mounted on the aerodynamic line of the nacelle. More specifically, the flank of the handle of the bolt is painted a bright color and the center of gravity of the bolt causes it to pivot such that it protrudes past the aerodynamic lines of the nacelle.

A visual inspection makes it possible to detect this orange color, which protrudes past the nacelle.

Also known is a mechanical detection system that provides for covering the bolts whereof the handle is mounted inside the aerodynamic lines of the nacelle with a hatch that provides the continuity of the lines of the nacelle.

This hatch cannot be closed when the bolt is not correctly locked, as interference is created between said hatch and the handle of the bolt.

To date, nacelles are known having a very low ground clearance, which necessarily requires that the locking indicators of the nacelle cowls be moved onto the side walls of the nacelle and above the latter.

The aforementioned systems cannot meet this requirement, making them irrelevant.

In this context, also known is a mechanical detection system for detecting the locking of the nacelle cowl able to meet the new constraints imposed by the current nacelles.

Such a system is protected by French patent application no. 10/58591, not yet published, in which a locking device is proposed between a first structure and a second structure of a cowl, comprising at least one locking pair including at least one lock bolt attached to the first structure and capable of engaging with at least one corresponding retaining means, attached to the second structure, the lock bolt being movably mounted against at least one elastic return means tending to return it to a position separated from the retaining means.

This locking device comprises a detection control rod, movably mounted between a first position in which it allows unlocking of the lock bolt of the retaining means, at least one part of the lock bolt then engaging with the control rod, so as to block it from potentially returning to a second position, and said second position in which the control rod engages with at least part of the locking pair so as to block the unlocking thereof.

However, this detection system has drawbacks.

On the one hand, it is extremely complex, multiplying the mechanical parts that must interact with each other to allow effective detection.

Furthermore, the position of the lock bolt of the locking pair is adjustable, so as to offset the leveling between the different structures of a cowl, which creates a quite variable position of the end of the lock bolt with respect to the control rod from one reverser to another.

It is thus difficult to ensure that in all scenarios, whether with extreme allowances or during deformation of parts, incorrect locking of the cowl will definitely be detected.

Furthermore, in this detection system, the detection control rod is subject to a visual indicator of the hatch type.

This assembly requires that this indicator be placed on the half-cowl bearing the lock bolt of the bolt while to open/close a bolt, one places oneself on the opposite half-cowl bearing the handle of the bolt.

Thus, this visual indicator is in fact only slightly or not at all visible to an operator having decided to open a bolt to perform maintenance on the nacelle.

This creates a risk of that operator damaging the handle of the bolt before realizing that the visual indicator was not open.

Thus, the operator must necessarily open the visual indicator before any opening of the bolt.

However, insofar as this indicator is offset with respect to the handle of the bolt, the operator must move on either side of the nacelle to open the bolts, which makes the detection system labor-intensive and not very practical.

SUMMARY

The present disclosure includes a locking device between a first structure and a second structure limiting the actions and movements to be done by the operator to detect unlocking of the nacelle cowl, in particular with respect to the nacelle standard to open the bolts.

In addition, the present disclosure includes a locking device between a first structure and a second structure that provides systematic detection of incorrect locking of the cowl.

To that end, the present disclosure provides a locking device between a first structure and a second structure, comprising at least one locking means designed to lock said first and second structures to each other, said locking means comprising at least one lock bolt attached to the first structure and able to engage in at least one means of engagement with the corresponding lock bolt which is attached to the second structure,

said locking device being characterized in that it further comprises:

an indicator as to whether the locking means has locked/unlocked the structures relative to one another, which is mounted on the same structure as the means of engagement with the lock bolt, said indicator having at least one locked state and one unlocked state,

a connecting system connecting the means of engagement with the lock bolt to said indicator, the means of engagement with the lock bolt being mounted such that it can move between a first position in which it is engaged with the lock bolt and allows said indicator to be locked, and a second position in which is free of the lock bolt and allows said indicator to be unlocked.

According to specific forms of the present disclosure, the device may comprise one or more of the following features, considered alone or in technically possible combinations:

the connecting system comprises means for controlling the change of state of said indicator, said control means being controlled by the position adopted by the means of engagement with the lock bolt.

the means for controlling the state change of said indicator further comprises means for automatic opening of said indicator.

said automatic opening means of said indicator may comprise an actuating link rod mounted at one of its ends on said indicator and connected at the opposite end to elastic means mounted on the second structure.

said automatic opening means of said indicator may comprise a piston associated with the elastic means.

the control means are capable of controlling locking means of said indicator suitable for: engaging with said indicator or the automatic opening means of said indicator when the means of engagement when the lock bolt is in the first position, and releasing said indicator when the means of engagement when the lock bolt is in the second position.

the locking means of said indicator may comprise a blocking rod of the indicator mounted so as to move in translation on the second structure, said rod being suitable for engaging either with a shoulder formed by said indicator or with a groove formed by the automatic opening means of the indicator.

the device comprising several locking means for locking said structures to each other, in particular arranged along a locking line, the connecting system comprises means for controlling the state change of said indicator shared by each of said locking means for locking said structures to each other, connected to each of them by at least one mechanical transmission means.

the means controlling the state change of said indicator shared by each of said locking means for locking said structures to each other comprise a control unit connected at one end to each of said mechanical transmission means, and at an opposite end, to the locking means of said indicator, said unit being slidingly mounted on the second structure.

The present disclosure also relates to a turbojet engine nacelle comprising at least one moving cowl, characterized in that it comprises at least one locking device associated with any one of the claims.

More particularly, it may be a moving cowl of a middle section surrounding a fan of the turbojet engine and/or a thrust reverser cowl.

Further areas of applicability will become apparent from the description provided herein. It should be understood that the description and specific examples are intended for purposes of illustration only and are not intended to limit the scope of the present disclosure.

DRAWINGS

In order that the disclosure may be well understood, there will now be described various forms thereof, given by way of example, reference being made to the accompanying drawings, in which:

FIGS. **1***a* and **1***b* are diagrammatic illustrations of an opening nacelle cowl equipped with a locking device according to a first form of the present disclosure, said device comprising a locking indicator of the cowl in the closed and open position, respectively;

FIGS. **2***a* and **2***b* are diagrammatic longitudinal cross-sectional side views of a locking means of the device of FIG. **1**, said locking means respectively being locked and unlocked;

FIGS. **3***a* and **3***b* are diagrammatic cross-sectional illustrations of a first form of automatic opening/closing means for the indicator of FIG. **1***a* in particular, said indicator respectively being closed and open;

FIG. **4** is a diagrammatic cross-sectional illustration of a second form of automatic opening/closing means of the indicator of FIG. **1***a;*

FIGS. **5***a* and **5***b* are diagrammatic cross-sectional illustrations of a form of control means for changing the state of the indicator of FIG. **1***a*, said indicator being closed and open, respectively; and

FIG. **6** is a diagrammatic illustration of an opening nacelle cowl equipped with a locking device according to a second form of the present disclosure, said device comprising a locking indicator for the cowl in the open position.

The drawings described herein are for illustration purposes only and are not intended to limit the scope of the present disclosure in any way.

DETAILED DESCRIPTION

The following description is merely exemplary in nature and is not intended to limit the present disclosure, application, or uses. It should be understood that throughout the drawings, corresponding reference numerals indicate like or corresponding parts and features.

FIGS. **1***a* and **1***b* illustrate an opening cowl **1** of a turbojet engine nacelle (not shown). More particularly, this may be a fan cowl or a thrust reverser cowl.

The cowl **1** is pivotably mounted around an upper hinge line (not shown) and can be locked in the lower part at a locking line along which a locking device **10** according to the present disclosure is installed.

This locking device **10** comprises at least one locking means **11** suitable for locking two parts of the cowl **1**.

In the figures, the locking device **10** comprises several locking means **11** mounted on a locking line.

A bolt **11** is shown in detail in FIGS. **2***a* and **2***b*.

It traditionally comprises a lock bolt **112** assuming the form of a stirrup **112** and capable of engaging with at least one engagement means assuming the form of the hook **111**.

The stirrup **112** is stationary with respect to the structure of the bolt on which it is mounted.

The stirrup **112** is attached to a part of the cowl **1**, while the hook **111** is connected to a second part of the cowl, the first and second parts of the cowl **1** being designed to be locked.

Furthermore, in reference to FIGS. **1***a* and **1***b*, the device **10** further comprises an indicator **20** of the locking/unlocking of the bolt(s) of the different parts of the cowl **1** with respect to each other.

This indicator is, in one non-limiting example of the present disclosure, a hatch **20**.

This hatch **20** is mounted on the same part of the cowl **1** as the hook **11**. It has at least one locked state and one unlocked state.

As illustrated in FIG. **1***a*, in one form, the locked state of the hatch **20** may amount to the closing of the hatch **20**, while the unlocked state of the hatch **20** amounts to the opening of the hatch **20**, as illustrated in FIG. **1***b*.

Advantageously, for each bolt **11**, the hook **111** of the bolt **11** is mounted so as to be able to move between a first position, in which it is engaged with the stirrup **112** (illustrated in FIG. **2***a*) and allows locking of the hatch **20**, and a second position, in which it is freed from the stirrup **112** (illustrated in FIG. **2***b*) and allows unlocking of the hatch **20**.

To that end, the device **10** further comprises a suitable connecting system **100** that connects the hook **111** of each corresponding bolt to the hatch **20**.

Such a connecting system **100** comprises control means **30** for controlling the change of state of the hatch **20** controlled by the position adopted by the hook **11** of each bolt **11**.

These control means **30** are capable of controlling locking means of the hatch **20**. More specifically, for each of the bolts **11**, they comprise a mechanical transmission element **31** connected to a hook **111**, as illustrated in FIG. **2***a* in particular.

In one non-limiting example, such an element **31** may be a cable. However, other alternative forms are possible, for example such as a chain.

In this FIG. **2***a*, a finger **113** mounted protruding from the body of the hook **111** is provided to receive one end of the cable **31**.

It should be noted that this finger may also be mounted on the bolt **11** and, in particular, on the handle connected to the hook **111**.

The mounting of this finger **113** results in modifying the type of bolt of the cowl **1** concerned by the locking device according to the present disclosure.

Thus, when the end of the cable **31** is fixed on the hook **111**, i.e., on the body of the bolt **11**, the locking system will be that regarding so-called primary bolts.

On the other hand, when the end of the cable **31** is fixed on the handle (not shown) connected to the hook **111** of a bolt, the locking system will be that regarding the so-called secondary bolts.

Furthermore, as illustrated in particular in FIG. **1***a*, the control means **30** further comprise a control unit **32** connected to each of the cables **31** connected to the hooks **111** of the bolts.

One particular form of the control unit **32** will be described later with respect to FIGS. **5***a* and **5***b*.

In one form, such a control unit **32** may also be connected, by a single mechanical transmission element **33**, to locking means **40** of the hatch **20**. Such a mechanical transmission element **33** may, as before, be a cable or any other suitable element.

In one alternative form illustrated in FIG. **6**, the control housing **32** may also be directly connected to the locking means **40** of the hatch **20**. The single mechanical transmission element **33** is eliminated.

In reference to FIGS. **3***a* and **3***b*, regarding the locking means **40** of the hatch **20**, the latter are suitable for:

- engaging with the hatch **20** when the hook **111** is in the first position engaged with the stirrup **112**, which will cause closing of the hatch **20**, as illustrated in FIG. **1***a*, and
- freeing the hatch **20** when the hook **111** is no longer engaged with the stirrup **112**, which will cause opening of the hatch **20**, as illustrated in FIG. **1***b*.

More specifically, in this alternative form, the locking means **40** are of the latch type **41**.

They comprise a rod **411** that can move in translation in a slide **412** against elastic return means **413**, the assembly being mounted, using a suitable housing **43**, on the cowl part **1** comprising the hatch **20**.

The rod is movable between:

- a deployed position, in which it cooperates with a shoulder **421** formed on the hatch **20**, so as to prohibit any opening of the hatch **20**, the elastic return means **413** being relaxed (illustrated in FIG. **3***a*), and

a retracted position, in which it frees the shoulder **421**, compressing the elastic return means **413**.

The rod **411** being connected to one end of the cable **33** indirectly connecting it to the control unit **32**, the slide of the rod **411** and its deployed or retracted position thus depend on the position of the hooks **111** of the bolts **11**.

In one non-limiting example illustrated in FIGS. **3***a* and **3***b*, a thin profile **42** is formed on the inner face of the hatch **20** protruding therefrom.

One of the branches of the profile **42** forming the shoulder **421** extends such that the rod **411** can form an abutment for that branch when the hatch **20** can be driven in outward rotation so as to be opened.

Thus, as illustrated in FIG. **3***a*, when the hook **111** is in the first position engaged with the stirrup **112**, the rod **411** slides, and places itself in the deployed position so as to form an abutment for the shoulder **421**, which causes closing of the hatch **20**.

As illustrated in FIG. **3***b*, when the hook **111** is no longer engaged with the stirrup **112**, the rod **411** is driven by the control means **30** in a translational movement toward its retracted position, as indicated by the arrow. It slides in the slide **412**, freeing the shoulder **421** and consequently the hatch **20**, allowing the latter to pivot and open.

One form of the control unit **32** is shown in reference to FIGS. **5***a* and **5***b*. Such a control unit **32** is mounted on the part of the cowl **1** comprising the hooks **111** of the bolts **11**.

As previously indicated, it is connected to the cables **31** secured to the hooks **111** of the bolts **11** and the cable **33** connected to the locking means of the hatch **20** and, more particularly, to the locking rod of the hatch **411**.

The control unit **32** comprises a hollow sleeve **321** open at both opposite ends.

Guide means **322** for the rod **411** for locking the hatch **20** are housed in the sleeve **321**. These guide means **322** are secured to cables **31** connected to the hooks **111** of the bolts **11** and the cable **33** connected to the locking means of the hatch **20**. These guide means **322** may be movable in translation without friction within the sleeve **321**, for example like a piston.

The movement of the piston **322** is driven by the movement of the cables **31** connected to the hooks **111** when the latter go from the locked position of the bolt **11** to an unlocked position of the bolt **11**, or vice versa.

The movement of the piston **322** will cause the sliding of the cable **33** and, consequently, that of the rod **411**, driving the locking or unlocking of the hatch **20** depending on the direction of movement. This mechanism is reversible.

In fact, within the sleeve **321**, elastic return means **323** bear on the base of the sleeve **321** situated on the side of the cables **31** connected to the bolts **11** at one end and are blocked at their opposite end by a flat surface of the piston **322**.

These elastic return means **323** include a compression spring capable of compressing when the piston **322** slides in the sleeve **321** and the cable **33** simultaneously pulls on the rod **411** to free the hatch **20**. This is illustrated in FIG. **5***b*, in which a single bolt designated A is being unlocked.

These elastic return means **323** tend to return the piston **322** to a position in which the rod **411** locks and drives the closure of the hatch **20**. This is illustrated in FIG. **5***a*, in which all of the bolts are locked, the elastic return means **323** relaxing, moving the piston **322** into a position corresponding to that of the locking of the hatch **20**.

Furthermore, in reference to FIGS. **3***a* and **3***b*, the control means **30** controlling the state change of the hatch **20** further comprises means **50** for automatic opening of the hatch **20**.

In one alternative form, the automatic opening means of the hatch **20** may comprise an actuating link rod **51** mounted at one of its ends on the hatch **20** and connected at the opposite end to at least one elastic return means **52** mounted in a housing **53** suitable for the part of the cowl **1** bearing the hook of the bolt **1**.

Such means are suitable for automatically driving the pivoting of the hatch **20** when the locking rod **411** has freed the shoulder **42** from the hatch **20**.

In fact, the hatch **20** no longer being locked, the elastic return means **52** tend to relax, causing, owing to the link rod **51**, the pivoting movement of the hatch **20**.

Thus, the elastic return means **52** provide that when all of the bolts **11** are locked, the control unit **32** returns to a position which allows the automatic locking of the hatch **20** when it is manually closed.

In reference to FIGS. **2***a*, **2***b*, **3***a*, **3***b*, **5***a*, **5***b*, a locking device **10** according to the present disclosure is implemented as follows.

In FIG. **2***a*, the bolt **11** is locked.

Once a bolt **11** is opened, whichever one it may be, as illustrated in FIG. **2***b*, traction is exerted on the corresponding cable **31** as indicated by the arrow.

In reference to FIG. **5***b*, this movement of the cable **31** drives the sliding of the piston **322** in the sleeve **321** and the compression of the spring **323**.

The movement of the piston **321** causes that of the cable **33**, connecting the unit **32** to the locking rod **411** of the hatch **20**, which is secured thereto.

In reference to FIGS. **3***a* and **3***b*, the pulling on the cable **33** allows and drives the sliding of the rod **411** so as to unlock the hatch **20**.

The hatch **20** being unlocked, it can pivot and open under the action of the link rod **51** and the spring **52**.

The operator will thus visually observe the opening of the hatch **20** without difficulty, since it is situated on the same structure as the hook **111** of the bolt **11**.

As long as a bolt **11** is open, one pulls on the transmission cables **31**, **33** and the hatch **20** cannot be kept closed.

In one alternative form of the control unit **32** illustrated in FIG. **6**, as previously indicated, the latter cooperates directly with the locking means **40** of the hatch **20**.

By installing the control unit **32** near the hatch **20**, the locking means **40** may be directly integrated into the unit **32**.

One thus eliminates numerous parts to be managed, in particular by eliminating the single cable **33**, the spring at the interface between the rod **411** and the slide **412** and the support **413**.

This alternative may be interesting for a small cowl or if the hatch **20** may be positioned closer to the bolt **11**.

In one alternative form illustrated in FIG. **4**, an alternative of the automatic opening/closing means **60** of the hatch **20** is shown.

In this alternative, the locking means **40** are suitable for:

- engaging with the automatic opening/closing means **60** of the hatch **20** when the hook **111** is in the first position engaged with the stirrup **112**, which will cause closing of the hatch **20**, as illustrated in FIG. **1***a*, and
- freeing the hatch **20** when the hook **111** is no longer engaged with the stirrup **112**, which will cause opening of the hatch **20** as illustrated in FIG. **1***b*.

As illustrated in FIG. **4**, the automatic opening/closing means **60** of the hatch **20** comprise a hollow housing **61** open at one free end.

A shaft **62** is mounted at the center of that housing **61**.

A piston **63** is also provided mounted on the shaft coaxially.

This piston comprises an end opposite the free end of the housing **61**, an annular groove **65** in which the spring-type elastic return means **64** is housed.

This spring **64** bears on the base of the housing **61** at one end and is blocked at its opposite end by the bottom of the groove **65** of the piston **63**.

The compression spring **64** is capable of compressing when the piston **63** slides in the housing **61** to engage with the locking rod **411**, as illustrated in FIG. **4**.

To that end, the piston **63** comprises a retaining groove **66** on its periphery, said groove being configured such that the rod **411** is housed in the concavity of the retaining groove **66** and forming an abutment for the side wall of the retaining groove **66**.

Thus, when traction is exerted on the cable **33**, the rod **411** slides toward its retracted position, frees the piston **63**, which, under the effect of the expansion of the spring **65**, slides in the housing **61**, and its free end pushes the hatch **20** such that it opens automatically. This mechanism is of course reversible.

Owing to a locking device **10** according to the present disclosure, the locking/unlocking indicator **20** of the bolts **11** of the cowl **1** will always correctly indicate the state of the bolts **11** and will prevent any state change that is not passed on to the indicator **20**.

In fact, the indicator **20** may only be placed in a locked state, i.e., closed and indicating that the cowl is indeed locked and completely locked, if all of the bolts **11** have been relocked.

In fact, in light of the connecting system and control means **30**, a single non-relocked bolt blocks the locking of the indicator **20** and does not allow it to return to the closed position.

Furthermore, the opening of the indicator **20** indicating the locking/unlocking of the bolts **11** of the cowl **1** is automatic once at least one bolt **11** is opened, which implies that the opening sequence of the cowls is identical to the nacelle standard in which there is no need to open the indicator **20** before opening the bolts **11**.

The locking device **10** according to the present disclosure proposes a safe, simple and effective locking detection system.

In this device, the chain of dimensions is very direct, which reinforces the effectiveness of the device.

Advantageously, with such a device, insofar as the hatch **20**, the hook **11** of the bolt, and the connecting system **100** between the two are mounted on the same part of the cowl **1** to be locked, the operator identifies the hatch even before accessing the bolts **11**.

The movements between the two parts of the cowl **11** to be locked together are eliminated, which facilitates maintenance operations and decreases the risks of deterioration of the bolts **11**.

Furthermore, the device **10** according to the present disclosure is mechanical and is therefore reliable and not subject to electrical failure.

Although the present disclosure has been described with one particular example form, it is of course in no way limited thereto and encompasses all technical equivalents of the described means, as well as combinations thereof if they are within the scope of the present disclosure.

In particular, the indicator is not limited to the use of a hatch **20** and may be any visual indicator capable of having two distinct states.

What is claimed is:

1. A locking device between a first structure and a second structure, comprising at least one locking means designed to lock said first and second structures to each other, said locking means comprising at least one lock bolt attached to the first structure and able to engage in at least one means of engagement with a corresponding lock bolt which is attached to the second structure, wherein said locking device further comprises:

an indicator as to whether the locking means has locked/unlocked the structures relative to one another, the indicator mounted on said first structure, wherein said indicator has at least one locked state and one unlocked state;

a connecting system connecting the means of engagement with the lock bolt to said indicator; and

a control unit comprising:

a guide means connected at one end to a cable connected to the indicator, and at an opposed end to a transmission element connected to the lock bolt for guiding the locking means; and

an elastic return means bearing against the guide means to drive the locked state of the indicator,

wherein the lock bolt can move between a first position, where the elastic return means is relaxed and the lock bolt is engaged with the means of engagement and allows said indicator to be locked, and a second position, where the elastic return means is compressed and a control means moves the lock bolt to be free of engagement with the means of engagement and allows said indicator to be unlocked.

2. The locking device according to claim **1**, wherein the connecting system comprises means for controlling a change of state of said indicator.

3. The locking device according to claim **2**, wherein the means for controlling the state change of said indicator is controlled by a position adopted by the means of engagement with the lock bolt.

4. The locking device according to claim **2**, wherein the means for controlling the state change of said indicator further comprises means for automatic opening of said indicator.

5. The locking device according to claim **4**, wherein said means for automatic opening of said indicator comprises an actuating link rod mounted at one of its ends on said indicator and connected at an opposite end to the elastic return means mounted on the first structure wherein the actuating link rod moves in translation in a slide against said elastic return means.

6. The locking device according to claim **4**, wherein said means for automatic opening of said indicator comprise a piston associated with the elastic return means and an actuating rod engaged with the piston.

7. The locking device according to claim **4**, wherein the means for controlling the state change are capable of controlling locking means of said indicator suitable for: engaging with said indicator or the means for automatic opening of said indicator when the means of engagement and the lock bolt is in the first position, and releasing said indicator when the means of engagement and the lock bolt is in the second position.

8. The locking device according to claim **7**, wherein the locking means of said indicator comprise a blocking rod of the indicator mounted so as to move in translation on the second structure, said rod being suitable for engaging either with a shoulder formed by said indicator or with a groove formed by the means for automatic opening of the indicator.

9. The locking device according to claim **1**, wherein the locking device comprises several locking means for locking said structures to each other, being arranged along a locking

line, wherein the connecting system comprises means for controlling the state change of said indicator shared by each of said locking means, the means for controlling the state change connected to each of the locking means by at least one mechanical transmission means.

10. The locking device according to claim **9**, wherein the means for controlling the state change of said indicator shared by each of said locking means for locking said structures to each other comprise the control unit connected at one end to each of said mechanical transmission means, and at an opposite end, to the locking means of said indicator, said unit being slidingly mounted on the second structure.

11. A turbojet engine nacelle comprising at least one moving cowl, wherein it comprises at least one locking device according to claim **1**.

12. The nacelle according to claim **11**, wherein the moving cowl is a moving cowl of a middle section surrounding a fan of the turbojet engine and/or a thrust reverser cowl.

13. A locking system comprising:

a locking device to lock a first structure and a second structure, the locking device comprising at least one lock bolt having one portion attached to the first structure and an engagement device attached to the second structure;

an indicator mounted on a same structure as the at least one lock bolt, the indicator controlled by locking/unlocking positions of the engagement device;

a connecting system connecting the locking device to the indicator; and

a control unit comprising:

a guide means connected at one end to a cable connected to the indicator, and at an opposed end to a transmission element connected to the lock bolt guiding the locking means; and

an elastic return means bearing against the guide means to drive the locked state of the indicator,

wherein the lock bolt can move between a first position, where the elastic return means is relaxed and the lock bolt is engaged with the means of engagement and allows said indicator to be locked, and a second position, where the elastic return means is compressed and a control means moves the lock bolt to be free of engagement with the means of engagement and allows said indicator to be unlocked.

14. The locking system according to claim **13**, wherein the connecting system comprises the control unit to control a change of state of the indicator via a locking device of the indicator.

15. The locking system according to claim **14**, wherein the control unit comprises an actuator to automatically open the indicator.

16. The locking system according to claim **15**, wherein the actuator comprises an actuating link rod mounted on at one of its ends on the indicator and connected at the opposite end to the elastic return means mounted on the second structure, wherein the actuating link rod moves in translation in a slide against said elastic return means.

17. The locking system according to claim **14**, wherein the locking device of the indicator comprises a blocking rod mounted so as to move in translation on the second structure, said blocking rod engaging either with a shoulder formed by the indicator or with a groove formed by the actuator.

18. The locking system according to claim **14**, wherein the control unit is mounted on the second structure and connected to a plurality of locking devices to lock the structures each other via at least one mechanical transmitter.

19. The locking system according to claim **13**, wherein the locking device comprises several locking means for locking said structures to each other, being arranged along a locking line, wherein the connecting system comprises means for controlling the state change of said indicator shared by each of said locking means, the means for controlling the state change connected to each of the locking means by at least one mechanical transmission means.

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